US007641280B2

(12) **United States Patent**
Uno et al.

(10) **Patent No.: US 7,641,280 B2**
(45) **Date of Patent: Jan. 5, 2010**

(54) **HEAD REST DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 422 days.

(21) Appl. No.: **11/148,837**

(22) Filed: **Jun. 9, 2005**

(65) **Prior Publication Data**

US 2006/0006709 A1 Jan. 12, 2006

(30) **Foreign Application Priority Data**

Jul. 2, 2004 (JP) 2004-196234

(51) **Int. Cl.**
B60N 2/42 (2006.01)
B60N 2/48 (2006.01)

(52) **U.S. Cl.** **297/216.12**; 297/216.14

(58) **Field of Classification Search** 297/216.12, 297/216.14

See application file for complete search history.

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(57) **ABSTRACT**

When a pressure receiving plate provided at a seat back moves to a rear side of a vehicle body when a vehicle is collided from behind, a Bowden cable transmits movement of the pressure receiving plate to a headrest ascending mechanism as a tensile load, thereby quickly ascending a headrest to reliably hold a head of an occupant. The Bowden cable transmits only the tensile load, and hence the Bowden cable is not buckled. Reduction in weight is made possible as compared with the case using a rod for transmitting a compression load. Since the Bowden cable is light, it is not required to unreasonably place the pressure receiving plate at a position near the headrest ascending mechanism for reduction in weight, and hence the pressure receiving plate can be placed at the optimal position where a sufficient driving force is obtained at the time of collision. Thus, a headrest is ascended with favorable responsiveness upon a rear-end collision of a vehicle while using a thin transmission member with low rigidity.

4 Claims, 4 Drawing Sheets

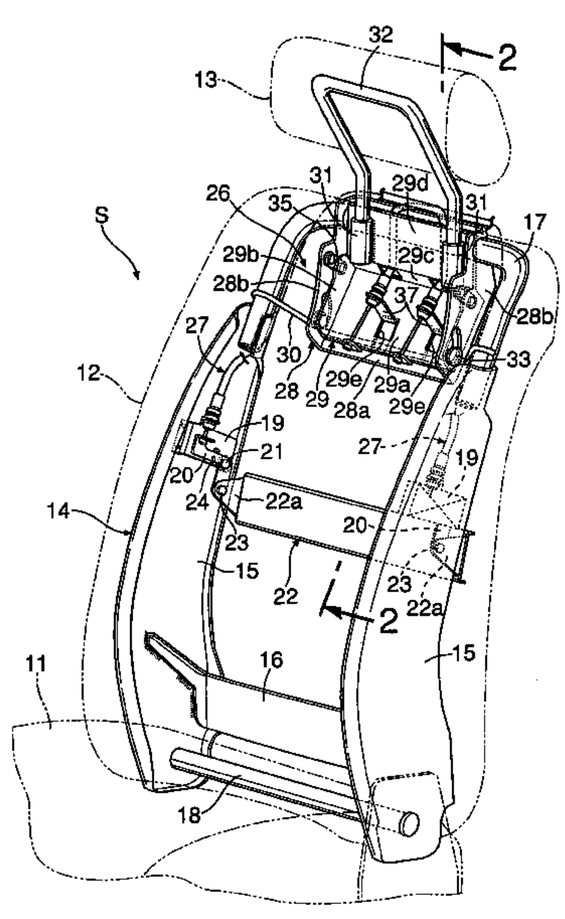

FIG.1

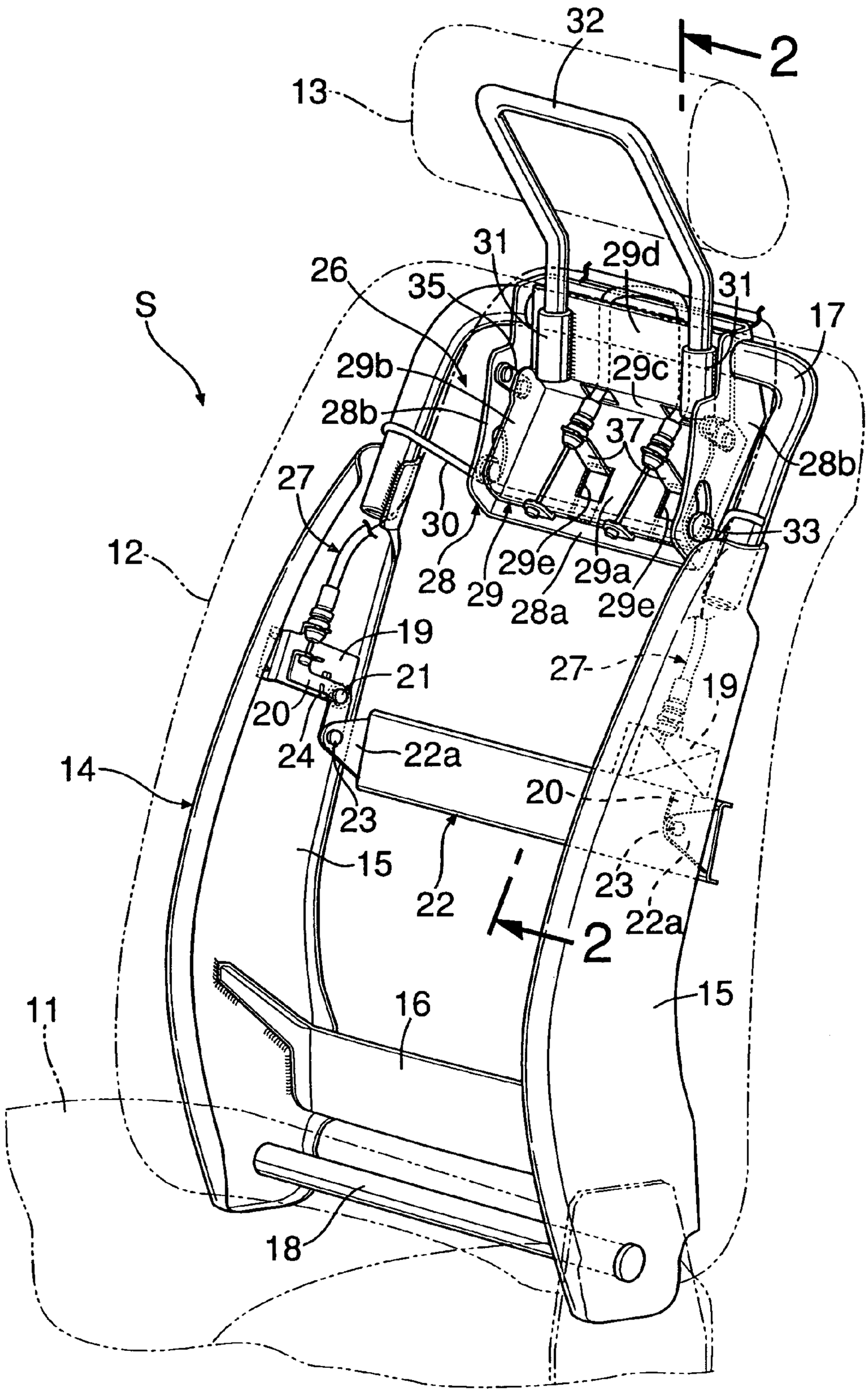
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FIG.2

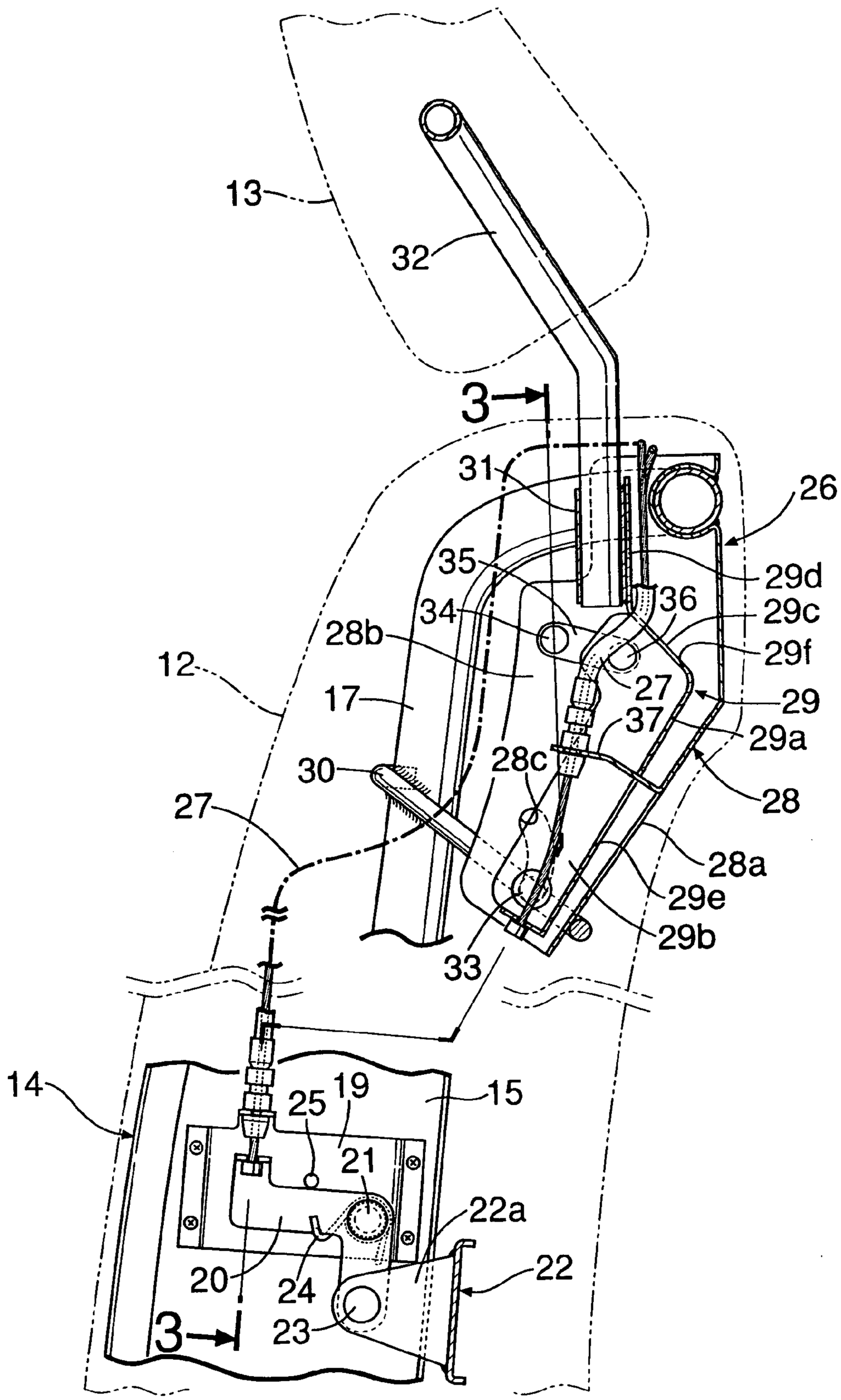
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FIG.3

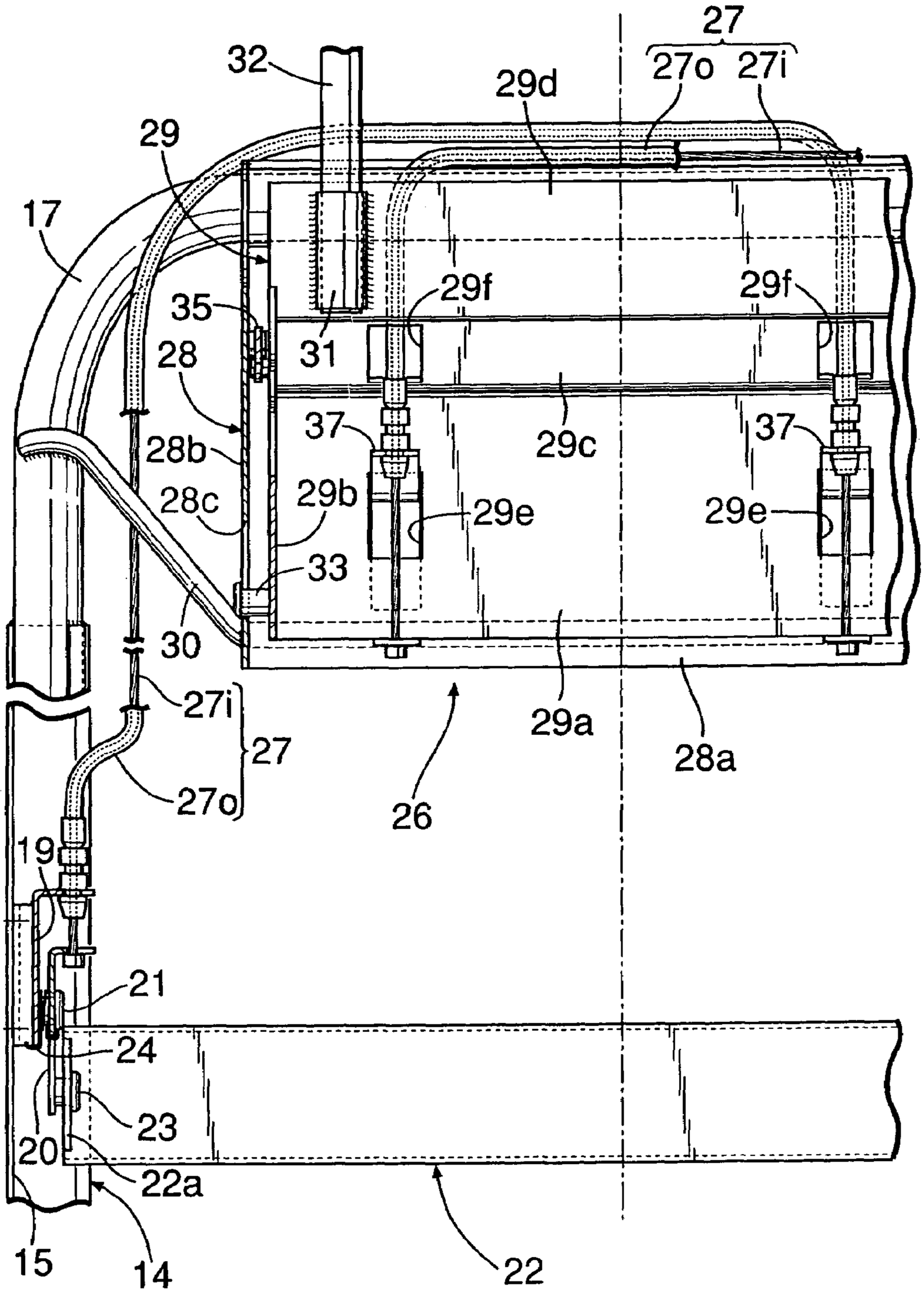
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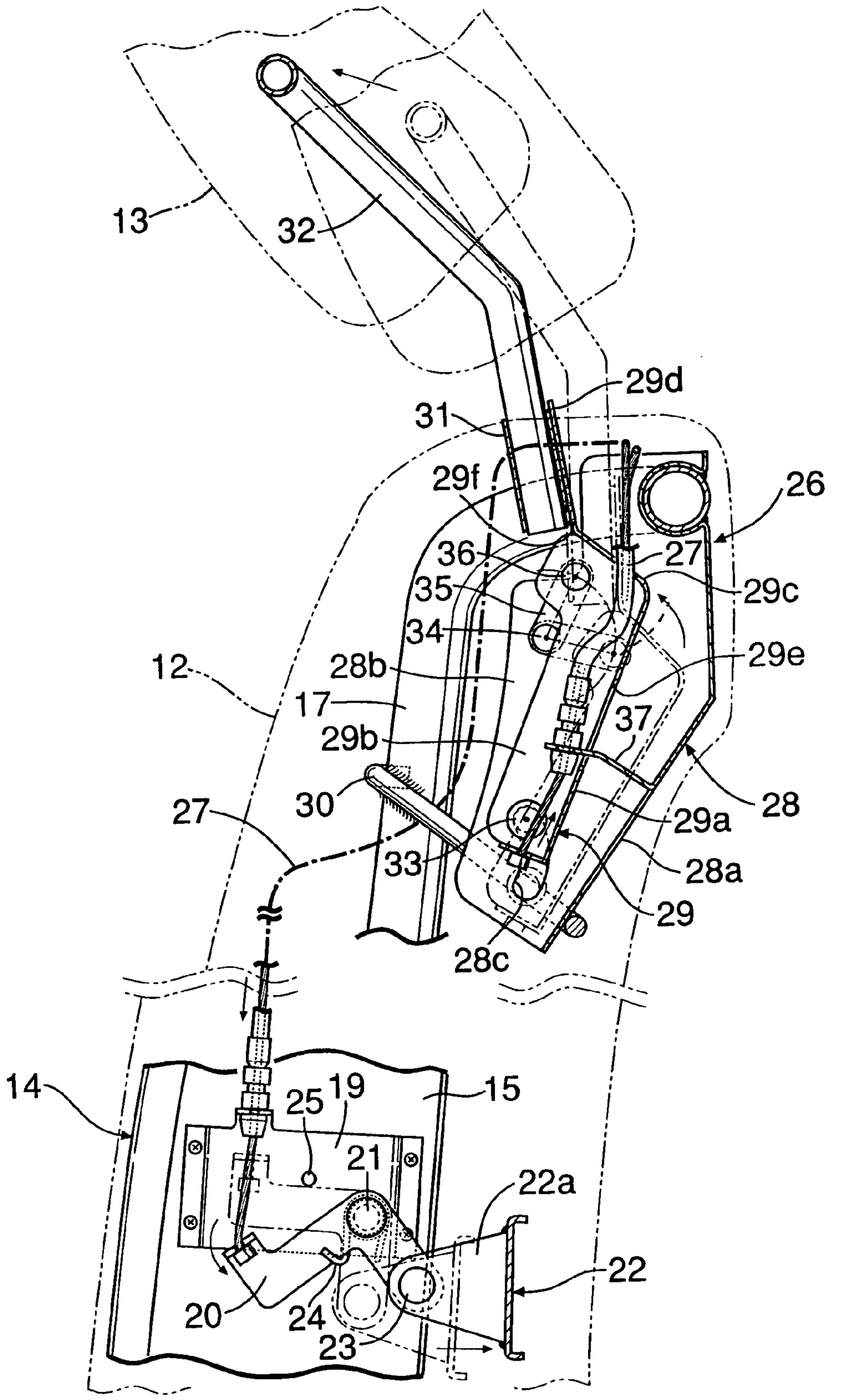
FIG.4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HEAD REST DEVICE

RELATED APPLICATION DATA

The Japanese priority application No. 2004-196234 upon which the present application is based is hereby incorporated in its entirety herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a headrest device comprising: a headrest ascending mechanism which ascendably supports a headrest at an upper end of a seat back; a pressure receiving plate which is provided at the seat back to face a back of an occupant and which moves to a rear side in a vehicle body by an inertia force upon a rear-end collision of a vehicle; and transmission means which connects the pressure receiving plate to the headrest ascending mechanism and which operates the headrest ascending mechanism to ascend the headrest when the pressure receiving plate moves to the rear side of the vehicle body.

2. Description of the Related Art

When a vehicle is struck from behind, not only the head of an occupant seated in a seat falls rearward, but also the position of the head tends to be higher than when normally seated because the occupant jumps up from the seat by impact. In order to eliminate the drawback, Japanese Patent Application Laid-open No. 11-268566 discloses a headrest device in which the movement of a pressure receiving plate that moves rearward by being pressed by the back of the occupant upon a rear-end collision is transmitted via transmission means to the headrest; and the headrest is moved forward to near the head of the occupant; and the headrest is simultaneously ascended or raised.

However, in the above-described conventional headrest device, the headrest is raised by converting the rearward movement of the pressure receiving plate into the upward movement of the rod-shaped transmission means. Therefore, a compression load is applied to the transmission means when the headrest ascends. Accordingly, unless a thick transmission means with high rigidity is used, there arises a possibility that the transmission means is bent and buckled when the headrest ascends, which not only makes it difficult to raise the headrest with favorable responsiveness but also makes it difficult to secure a space for placing the transmission means inside the seat back.

SUMMARY OF THE INVENTION

The present invention has been achieved in view of the above-mentioned circumstances, and is directed toward a method and apparatus for ascending or raising a headrest upon a rear-end collision of a vehicle while using a thin transmission member with low rigidity.

In accordance with the present invention, there is provided a headrest device comprising: a headrest ascending mechanism which ascendably supports a headrest at an upper end of a seat back; a pressure receiving plate which is provided at the seat back to face a back of an occupant and which moves to a rear side of a vehicle body by an inertia force upon a rear-end collision of a vehicle; and transmission means which connects the pressure receiving plate to the headrest ascending mechanism and which operates the headrest ascending mechanism to ascend or raise the headrest when the pressure receiving plate moves to the rear side of the vehicle body, wherein the transmission means is a long member and transmits rearward movement of the pressure receiving plate to the headrest ascending mechanism as a tensile load.

Also, according to a second feature of the invention, the transmission means is a Bowden cable.

Further, according to a third feature of the invention, the Bowden cable extends from the pressure receiving plate to run upward in the seat back, and is then bent downward to be connected to the headrest ascending mechanism.

With the configuration according to the first feature, when the pressure receiving plate provided at the seat back is moved to a rear side of the vehicle body when the vehicle is collided from behind, the transmission means constructed by the long member transmits the movement of the pressure receiving plate to the headrest ascending mechanism as the tensile load. Therefore, the headrest is quickly raised to reliably hold the head of the occupant. Since the transmission means transmits only the tensile load, even if it is constructed by a long thin member with low rigidity, the transmission means is not buckled. Therefore, not only reduction in weight of the transmission means is possible, but also the degree of freedom of layout is increased. Since the transmission means is light in weight, it is not required to unreasonably dispose the pressure receiving plate at the position near the headrest ascending mechanism for reduction of weight, and the pressure receiving plate can be disposed at the optimal position where a sufficient drive force can be obtained upon a rear-end collision.

In further accordance with the present invention, the transmission means is constructed by the Bowden cable having flexibility, and therefore the transmission means can not only be made compact and light, but also the layout can be made easy so that the transmission means does not interfere with the other members in the seat back.

In further accordance with the present invention, the Bowden cable is bent downward after extending upward from the pressure receiving plate, and connected to the headrest ascending mechanism. Therefore, the headrest can be directly ascended or raised with the upward tensile load of the Bowden cable, and the structure of the headrest ascending mechanism can be simplified. The above-mentioned object, other objects, characteristics, and advantages of the present invention will become apparent from an explanation of a preferred embodiment, which will be described in detail below by reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a seat for an automobile, including a headrest device according to the present invention.

FIG. **2** is a cross-sectional view as seen along line **2-2** in FIG. **1**.

FIG. **3** is a cross-sectional view as seen along line **3-3** in FIG. **2**.

FIG. **4** is a cross-sectional view corresponding to FIG. **2** illustrating operation of the headrest device according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A mode of carrying out the present invention will be described based on an embodiment of the present invention shown in the attached drawings.

As shown in FIG. **1**, a seat S for an automobile includes: a seat cushion **11** which supports buttocks of an occupant; a seat back **12** which is pivotally supported at a rear end of the

seat cushion **11** to reclinably support a back of the occupant; and a headrest **13** which is provided at an upper end of the seat back **12** to ascendably support a head of the occupant.

A seat back frame **14** which constructs a framework of the seat back **12** includes: left and right side frames **15** and **15** made of a metal plate; a lower frame **16** made of a metal plate which connects lower ends of the left and right side frames **15** and **15**; an upper frame **17** made of a metal pipe which connects upper ends of the left and right side frames **15** and **15**; and a reclining shaft **18** for pivotally supporting the seat back **12** at the seat cushion **11**.

As is obvious from FIGS. **1** to **3**, bell cranks **20** and **20** are pivotally supported by support pins **21** and **21** at brackets **19** and **19** fixed at inner surfaces of intermediate portions in a vertical direction of the left and right side frames **15** and **15**. Arm parts **22***a* and **22***a* project forward from left and right opposite ends of a pressure receiving plate **22** disposed at a position opposed to a central part of the back of the occupant seated in the seat S. The arm parts **22***a* and **22***a* are pivotally supported at downward-extending end portions of the left and right bell cranks **20** and **20** by support point pins **23** and **23** respectively. The bell cranks **20** and **20** are biased in the clockwise direction in FIG. **2** by torsion springs **24** and **24**, and forward-extending end portions thereof stop at positions abutting on stopper pins **25** and **25**. At this time, the pressure receiving plate **22** advances to the forward-most side in the vehicle body.

A headrest ascending mechanism **26** is disposed inside the upper frame **17** of the seat back frame **14**. The left and right bell cranks **20** and **20** are connected to the headrest ascending mechanism **26** by two Bowden cables **27** and **27** which comprises outer tubes **27***o* and **27***o* and inner cables **27***i* and **27***i* slidably housed inside the outer tubes **27***o* and **27***o*.

The headrest ascending mechanism **26** includes: a fixed base **28** fixed to the upper frame **17**; and a movable base **29** supported at the fixed base **28** to be movable vertically. The fixed base **28** is a member which has a bottom wall **28***a* and left and right side walls **28***b* and **28***b* and is formed into a U-shape in section, with its upper part being directly fixed to the upper frame **17** and its lower part fixed to the upper frame **17** via a stay **30**. The movable base **29** disposed on a front surface of the fixed base **28** includes: a bottom wall **29***a*; left and right side walls **29***b* and **29***b*; an upper wall **29***c*; and a headrest support wall **29***d*. Opposite lower ends of a headrest frame **32** in an inversed U-shape are fitted into and fixed to a pair of pipe-shaped headrest mounting members **31** and **31** which are fixed on the front surface of the headrest support wall **29***d*.

Arc-shaped guide holes **28***c* and **28***c* are formed at lower portions of the left and right side walls **28***b* and **28***b* of the fixed base **28**. Guide pins **33** and **33** provided at lower portions of the left and right side walls **29***b* and **29***b* of the movable base **29** slidably engage with the guide holes **28***c* and **28***c*. One ends of links **35** and **35** are pivotally supported at upper portions of the left and right side walls **28***b* and **28***b* of the fixed base **28** with support point pins **34** and **34**. The other ends of the links **35** and **35** are pivotally supported at upper portions of the left and right side walls **29***b* and **29***b* of the movable base **29** with support point pins **36** and **36**.

A pair of stays **37** and **37** fixed at the bottom wall **28***a* of the fixed base **28** penetrate forward through a pair of openings **29***e* and **29***e* formed at the bottom wall **29***a* of the movable base **29**. Lower ends of the outer tubes **27***o* and **27***o* of the pair of Bowden cables **27** and **27** are fixed at the left and right brackets **19** and **19**, and upper ends thereof penetrate through openings **29***f* and **29***f* of the upper wall **29***c* of the movable base **29** to be fixed to the stays **37** and **37** of the fixed base **28**. The lower ends of the inner cables **27***i* and **27***i* of the pair of Bowden cables **27** and **27** are fixed to the forward-extending end portions of the left and right bell cranks **20** and **20**, and the upper ends thereof are fixed to the bottom wall **29***a* of the movable base **29**. At this time, the pair of Bowden cables **27** and **27** are bent in an inversed J-shape and intersect each other at bent portions.

Next, an operation of the embodiment including the above described construction will be explained.

When the vehicle is collided from behind and the vehicle body is pushed forward, the occupant seated in the seat S is to stay at the original position by inertia, and therefore the back of the occupant presses the pressure receiving plate **22** of the seat back frame **14** toward the rear side of the vehicle body. As a result, since the downward-extending end portions of the bell cranks **20** and **20** move rearward, and the forward-extending end portions thereof move downward, the one end portions of the inner cables **27***i* and **27***i* of the Bowden cables **27** and **27** connected to the end portions of the bell cranks **20** and **20** are drawn downward, whereby the other end portions of the inner cables **27***i* and **27***i* are lifted upward, so that the movable base **29** is lifted upward.

When the movable base **29** moves upward with respect to the fixed base **28**, the guide pins **33** and **33** provided at the lower portions of the movable base **29** are guided upward along the guide holes **28***c* and **28***c* which are formed at the lower portion of the fixed base **28**, and the upper portion of the movable base **29** is guided upward with respect to the upper portion of the fixed base **28** via the links **35** and **35**. Therefore, the headrest **13** moves forward while ascending as shown in FIG. **4**, thereby reliably holding the head of the occupant which moves rearward and jump up due to impact of the rear-end collision.

As described above, when being collided from behind, the drive force of the pressure receiving plate **22** to move rearward is transmitted to the headrest ascending mechanism **26** only through tensile loads of the Bowden cables **27** and **27** serving as the transmission means, and therefore there is no fear of buckling of the transmission means in its transmission route. Accordingly, the pressure receiving plate **22** does not need to be unreasonably placed at the position near the headrest ascending mechanism **26**, and the pressure receiving plate **22** can be placed at an optimal position where a sufficient driving force can be obtained upon the rear-end collision. In addition, it is not required to use a heavy transmission member with high rigidity to avoid buckling, and the headrest **13** can be ascended with favorable responsiveness by using the Bowden cables **27** and **27** which are compact and light and are easily installed without the interference with the other members.

Further, since the Bowden cables **27** and **27** are bent downward after extending upward from the bell cranks **20** and **20** which are operated by the pressure receiving plate **22**, and connected to the movable base **29** of the headrest ascending mechanism **26**, the headrest **13** can be directly ascended with the upward tensile load of the Bowden cables **27** and **27**, and the structure of the headrest ascending mechanism **26** can be simplified. Furthermore, since the left and right Bowden cables **27** and **27** are made to intersect each other at the bent portions at their upper ends, smooth operation can be achieved by making the radius of curvature of each of the Bowden cables **27** and **27** at the bent portions.

The embodiment of the present invention has been described above, but various design changes can be made within the subject matter of the present invention.

For example, the transmission means of the present invention is not limited to the Bowden cables **27** and **27**, and any

optional long member (specifically, a cable or a rod) capable of transmitting the movement of the pressure receiving plate **22** to the headrest ascending mechanism **26** as a tensile load can be adopted.

When a cable is adopted as the transmission means, the downward tensile load can be converted into an upward tensile load by winding the intermediate portion of the cable around a pulley, and when a rod is adopted as the transmission means, the downward tensile load can be converted into an upward tensile load by connecting two rods through an intermediate link or the like.

Also, it is possible to transmit the downward tensile load of the transmission means to the headrest ascending mechanism **26** as it is, and then convert the downward tensile load into an upward load which pushes up the headrest **13** inside the headrest ascending mechanism **26**.

What is claimed is:

1. A method for raising a headrest upon a rear-end collision of a vehicle, comprising the steps of:

providing a seat back assembly comprising:

a seat back, said seat back including a pressure receiving plate, a headrest ascending mechanism, a force transmitting device, and a headrest, said pressure receiving plate facing toward a back of an occupant and being adapted to move rearwardly upon by an inertia force during the rear-end collision of the vehicle, said headrest ascending mechanism ascendably supporting the headrest at an upper end of the seat back, said force transmitting device operably connecting the pressure receiving plate to the headrest ascending mechanism and being operable to cause the headrest ascending mechanism to raise the headrest when the pressure receiving plate moves to the rear side of the vehicle body;

upon experiencing the rear-end collision, moving the pressure receiving plate rearwardly;

transmitting said movement of the pressure receiving plate via the force transmitting device, to the headrest ascending mechanism as a tensile load;

raising the headrest by directly applying the tensile load in an upward direction on the headrest and thereby pulling the headrest into a raised position

wherein the force transmitting device is two Bowden cables, and wherein the Bowden cables extend upwardly from the pressure receiving plate through the seat back, and are then bent at a bend portion to extend downward to be connected to the headrest ascending mechanism, and

wherein the two Bowden cables intersect with one another at the bend portion.

2. The method of claim **1**, wherein the Bowden cables extend upwardly from the receiving plate through a side frame of the seat back, and are then bent downward at a top portion of the seat back to be connected to the headrest ascending mechanism.

3. The method of claim **1**, wherein each of the two Bowden cables are connected to the headrest ascending mechanism with a lateral distance spaced therebetween.

4. A method for raising a headrest upon a rear-end collision of a vehicle, comprising the steps of:

providing a seat back assembly comprising:

a seat back, said seat back including a pressure receiving plate, a headrest ascending mechanism, a force transmitting device, and a headrest, said pressure receiving plate facing toward a back of an occupant and being adapted to move rearwardly upon by an inertia force during the rear-end collision of the vehicle, said headrest ascending mechanism ascendably supporting the headrest at an upper end of the seat back, said force transmitting device operably connecting the pressure pressure receiving plate to the headrest ascending mechanism and being operable to cause the headrest ascending mechanism to raise the headrest when the pressure receiving plate moves to the rear side of the vehicle body;

upon experiencing the rear-end collision, moving the pressure receiving plate rearwardly;

transmitting said movement of the pressure receiving plate via the force transmitting device, to the headrest ascending mechanism as a tensile load;

raising the headrest by directly applying the tensile load in an upward direction on the headrest and thereby pulling the headrest into a raised position,

wherein the headrest ascending mechanism further includes a guide angled towards the front of the vehicle, such that when the headrest is raised, the headrest also moves in a horizontal direction toward the front of the vehicle.

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